# I. BACKGROUND

In this staff report, we present the results of an evaluation of automotive coatings which led to our proposal for a Suggested Control Measure (SCM). The assessment included: a survey of automotive coatings sold in California in 2001; an examination of several compliance flexibility options; technical assessments for the various coating categories; an environmental impact assessment; and a cost impact analysis. The proposed SCM for automotive coatings is the first collaborative regulatory effort undertaken by the Air Resources Board (ARB/Board) staff, the air pollution control or air quality management districts (districts), and affected industry representatives for this coating category. The development of the SCM was the direct result of a request from the districts for ARB to provide technical assistance to improve the consistency and enforceability of existing rules.

## A. OVERVIEW

Automotive coatings are coatings used, or recommended for use, in motor vehicles or mobile equipment refinishing, repair, or restoration. Typical automotive coatings include primers, color coatings and clear coatings. These coatings are used for refinishing vehicles such as: automobiles, trucks, buses, golf carts, vans, motorcycles, tanks, armored personnel carriers, trains, railcars, truck trailers, mobile cranes, bulldozers and street cleaners. The estimated volatile organic compound (VOC) emissions from automotive coatings in California were about 20.7 tons per day (tpd), on an annual average basis, in 2001. This represents about two percent of the total stationary source VOC emissions.

VOCs are precursors to the formation of ozone and particulate matter (PM). Ozone and PM are two of the most serious air pollutants for which the State and national ambient air quality standards are exceeded in much of California. Ozone is formed from photochemical reaction of oxides of nitrogen and VOCs. Scientific studies show that exposure to ozone can result in reduced lung function, increased respiratory symptoms, increased airway hyperreactivity, and increased airway inflammation. Exposure to ozone is also associated with premature death, hospitalization for cardiopulmonary causes, asthma episodes and restrictions in physical activity. Ozone is a strong oxidizer and exposure to levels of ozone exceeding the current ambient air quality standards lead to a variety of adverse health effects, as well as a reduction of crop and timber production, and damage to plants and property. Emissions of VOCs also react in the atmosphere to form $PM_{10}$ and $PM_{2.5}$. Inhalation of $PM_{10}$ and $PM_{2.5}$ deep into the lungs reduces human pulmonary function. Premature deaths linked to $PM_{10}$ and $PM_{2.5}$ exposure are now at levels comparable to deaths from motor vehicle accidents and second-hand smoke. Attaining the current State ambient air quality standards for $PM_{10}$ and ozone would annually prevent approximately 6,500 premature deaths or three percent of all deaths in California. (ARB, 2002)

## B. AUTOMOTIVE COATINGS MANUFACTURERS

The automotive coatings market in California was estimated at approximately 3.7 million gallons in 2001. Approximately 95 percent of the total sales for 2001 were supplied by seven manufacturers. Table I-1 lists the top seven manufacturers based on data reported in the 2002 Survey (ARB, 2005).

Automotive coatings are normally supplied to automotive refinishing facilities through a network of distributors (jobbers). The distributors are generally independent businesses or may be owned by the coating manufacturer (e.g., Sherwin Williams). Most distributors sell coatings locally or regionally.

**Table I-1 - Top Seven Coatings Manufacturers**

| Company | Scope |
|---|---|
| Akzo Nobel | Global |
| BASF | Global |
| DuPont | Global |
| Ellis Paint | California |
| PPG | Global |
| Sherwin Williams | Global |
| Standox/Spies Hecker | Global |

Automotive coatings are formulated using solids and liquids. The solids consist of three main categories: (1) resins (polymers or binders) bind the pigments and additives together and form a film upon drying. Sometimes co-polymers are used to modify the properties of the primary resin. Some resins used in automotive coatings include alkyds, latex, oils, vinyl, acrylics, celluloses, epoxies, urethanes, and polyurethanes; (2) pigments are finely ground powders dispersed in the coating; pigments provide color, hide the underlying surface, and contribute other properties; and (3) additives or specialty chemicals which assist in manufacture and application, may improve the properties of the finished film. Examples of additives include preservatives, wetting agents, coalescing agents, freeze-thaw stabilizers, anti-foam agents, and thickeners. Liquids are usually solvents, which are the volatile carriers used to control the viscosity of the coating and provide application properties. Some typical solvents used are: aromatic or aliphatic hydrocarbons, ketones, esters, alcohols, glycols, glycol ethers, and water.

Most automotive coatings are sold as components with a few available for use in ready-to-use containers. The coating components are mixed in the automotive refinishing facility, as needed, by the painter, prior to use. Mixing ratios of components can vary depending on temperature and other factors. Generally, to make the coating ready to spray, the process requires combining the base product with a VOC solvent, water, or an exempt solvent depending upon the manufacturer's specifications for reaching the correct viscosity for spraying application. Colors normally require inter-mixing various toners in order to achieve the desired color.

Table I-2 is a chronology of the development of automotive coatings technologies (Entec, 2000). Most automotive refinishing facilities have a “mixing bank”, and may use an automatic mixing machine to insure precise color formulations. Small operations use ready-to-spray (RTS) coatings or will acquire the mixed coatings from a supplier or jobber.

| Table I-2 - Chronology of Development of Coating Technologies | |
|---|---|
| **Date** | **Coating Technology** |
| 1920s | Nitrocellulose Resins |
| 1950s | Alkyd Resins |
| 1960s | Thermoplastic Acrylic Resins |
| 1970s | 2 Component Polyurethane-Acrylic Resins |
| 1990s | High Solids Urethanes |

## C. AUTOMOTIVE REFINISHING FACILITIES

Automotive coatings operations are conducted at automotive refinishing facilities which include auto body repair/paint shops, production auto body paint shops, new car dealer repair/paint shops, fleet operator repair/paint shops and custom restoration facilities. Some of these facilities do collision repair and some do commercial vehicle refinish and repair. While we do not have a specific breakdown of facilities doing commercial (fleet) vehicle refinish only, we expect this group to be relatively small. Most of the facilities perform collision repair and refinishing for the passenger car segment with some performing mostly complete paint jobs (i.e., facilities such as MAACO and Earl Scheib).

The total number of facilities involved in the repair and refinishing of vehicles is estimated to range from about 4,000 to over 6,000. (DuPont, 2005; DCA, 2005). Many of these operations do not have a district permit because they use relatively small volumes of coatings. Some districts do not require a permit if a facility uses less than a specified volume of coatings and cleaning solvents, typically one gallon per day. However, most districts require a permit if a facility has a spray booth, regardless of the volume of coatings and cleaning solvents used.

The majority of automotive refinishing facilities are small businesses typically having from one to five employees. Table I-3 lists the number of facilities based on gross annual revenue. Over 70 percent of automotive refinishing facilities are estimated to have one million dollars or less in annual revenue (DuPont, 2005). Some of these facilities may be doing body repair work without painting the vehicle. We are aware that some facilities subcontract the painting portion of the repair job. However, we are unable to quantify the number of facilities involved only in body repair.

| Table I-3 - Distribution of Automotive Refinishing Facilities Grouped by Total Annual Revenue in 2002 | | |
|---|---|---|
| **Total Annual Revenue** | **Number of Facilities** | **Percent of Total** |
| Less than $0.5 Million | 2,074 | 50.4 |
| $0.5 to $1 Million | 878 | 21.3 |
| >$1 to $2.5 Million | 883 | 21.5 |
| > $2.5 Million | 278 | 6.8 |
| Total Statewide | 4,113 | 100 |

The automotive refinishing facilities vary greatly in size and level of sophistication. Some automotive refinishing facilities are medium to large, well run, relatively automated facilities while others are family-run shops, which may have one or two employees. Table I-4 shows the estimated number of automotive refinishing facilities in the larger districts. (DuPont, 2005)

| Table I-4 - Estimated Number of Automotive Refinishing Facilities by District | |
|---|---|
| **District** | **Number of Facilities** |
| South Coast Air Quality Management District (SCAQMD) | 1,790 |
| Bay Area Air Quality Management District (BAAQMD) | 934 |
| San Joaquin Valley Air Pollution Control District (SJUVAPCD) | 330 |
| Sacramento Metropolitan Air Quality Management District (SMAQMD) | 171 |
| Other Districts | 888 |
| Total Statewide | 4,113 |

## D. REGULATORY AUTHORITY

In California, the districts have primary responsibility for controlling emissions from automotive refinishing facilities. In 1988, the districts began to develop regulations for automotive coatings and refinishing operations.

### 1. District Rules in California

Typically, the districts develop regulations that define coating categories and set VOC limits that affect manufacturers, suppliers, and users of automotive coatings. The rules establish VOC content limits to achieve the maximum feasible emission reductions. Coatings that are high in VOCs are either replaced with an existing low-VOC coating, or are reformulated to meet the VOC limits established in the rules.

The ARB has authority to oversee the districts' activities. In consultation with the districts, the affected industry and the U.S. EPA, ARB staff developed the proposed SCM. The SCM will be used as a model by the districts when adopting or amending their automotive coatings rules. The SCM will provide uniformity and enhance enforcement of district rules. In Chapter III, we provide a detailed description of the proposed SCM.

Twenty of the 35 districts in California have rules regarding automotive coatings. Currently, approximately 95 percent of the State's population is covered by the existing district rules. Most of the rules have been included in the State's Implementation Plan (SIP). Table I-5 lists the districts' rules for this category.

**Table I-5 - Existing District Rules**

| District | Rule Number | Adopted | Last Amended |
|---|---|---|---|
| Antelope Valley APCD | 1151 | 7-8-88 | 7-20-99 |
| Bay Area AQMD | 8-45 | 6-7-89 | 7-1-99 |
| Butte County APCD | 235 | 6-19-97 | 8-22-02 |
| El Dorado County APCD | 230 | 9-27-94 | |
| Feather River AQMD | 3-19 | 8-6-98 | |
| Glenn County APCD | V-105 | 5-19-99 | |
| Imperial County APCD | 427 | 9-14-99 | |
| Kern County APCD | 410-4A | 5-16-91 | 3-7-96 |
| Mojave Desert AQMD | 1116 | 3-2-92 | 4-12-99 |
| Placer County APCD | 234 | 11-3-94 | 4-9-98 |
| Sacramento Metropolitan AQMD | 459 | 12-7-95 | 10-2-97 |
| San Diego County APCD | 67-20 | 11-13-96 | 8-13-97 |
| San Joaquin Valley APCD | 4602 | 4-11-91 | 12-20-01 |
| San Luis Obispo County APCD | 423 | 2-23-88 | 11-13-02 |
| Santa Barbara County APCD | 339 | 8-13-97 | 4-17-19 |
| Shasta County AQMD | 3-25 | 4-1-97 | |
| South Coast AQMD | 1151 | 7-8-88 | 12-11-98 |
| Tehama County APCD | 4-35 | 11-10-98 | |
| Ventura County APCD | 74-18 | 1-28-92 | 9-10-96 |
| Yolo-Solano County AQMD | 2-26 | 8-13-97 | |

Although there are some similarities in the district rules, the rules vary from district to district. Some of the differences include: definitions of terms, coating categories, VOC limits, exemptions allowed, and recordkeeping requirements. Table I-6 summarizes the key VOC limits from four district rules.

**Table I-6 – Summary of VOC Limits**

| | SCAQMD Rule 1151 | | SJUVAPCD Rule 4602 | | SMAQMD Rule 459 | | BAAQMD Rule 8-45 | |
|---|---|---|---|---|---|---|---|---|
| | Cars* | Large** Vehicles | Cars | Large Vehicles | Cars | Large Vehicles | Cars | Large Vehicles |
| **Category** | g/l | g/l | g/l | g/l | g/l | g/l | g/l | g/l |
| Pretreatment Wash Primer | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 |
| Precoat | N/A | N/A | 600 | 600 | 600 | 600 | 580 | 580 |
| Primer/Primer Surfacer | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| Primer Sealer | 340 | 250 | 420 | 340 | 420 | 250 | 420 | 340 |
| Topcoat | 420 | 340 | 420 | 420 | 420 | 420 | 420 | 420 |
| Metallic Iridescent Topcoat | 420 | 340 | 520 | 420 | 520 | 420 | 520 | 420 |
| Multi-stage Topcoat | 420 | 340 | 540 | N/A | 540 | N/A | 540 | N/A |
| Specialty Coating | 840 | 840 | 840 | 840 | 840 | 840 | 840 | 840 |
| Camouflage | N/A | N/A | N/A | 420 | N/A | 420 | N/A | 420 |
| Multi-Colored | 685 | 685 | N/A | N/A | N/A | N/A | N/A | N/A |
| Multi-Colored Multistage | 420 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Rubberized Asphaltic Underbody | N/A | N/A | N/A | N/A | 540 | 540 | N/A | N/A |
| Temporary Protective Coating | N/A | N/A | 60 | 60 | 60 | 60 | N/A | N/A |

* *Passenger cars, small-sized trucks and vans, medium-sized trucks and vans, motor homes and motorcycles.*

** *Large sized trucks, buses and mobile equipment*

## 2. The National Automotive Coatings Rule

The districts that do not have their own rule for automotive coatings implement U.S. EPA's national rule. In the 1990 Clean Air Act Amendments, the United States Congress enacted section 183(e), which established a new regulatory program for controlling VOC emissions from consumer and commercial products. Section 183(e) directs the U.S. EPA Administrator to determine the ozone forming potential of these products, and to prioritize the need for regulation of these products.

The U.S. EPA promulgated a final rule to control VOC emissions from automotive refinish coatings, such as primers and topcoats on August 14, 1998. The national rule was published in the Federal Register on September 11, 1998 (EPA, 1998). This rule was specifically aimed at manufacturers and importers of automotive coatings. However, the national rule had little effect on the rules already adopted by the districts. The VOC limits in the district rules are generally more stringent than those in the national rule.

### 3. California Clean Air Act

In addition to the federal planning requirements, the CCAA imposes a separate set of planning requirements on districts. The CCAA was enacted in 1988, and has the fundamental goal that all areas of California are to attain the State ambient air quality standards for ozone by the earliest practicable date. The Board sets the State ozone standards. In March 2005, the Board reviewed California's 1-hour standard for ozone and determined that it alone was not sufficiently protecting human health. Consequently, ARB adopted a new 8-hour standard for ozone and retained the existing 1-hour ozone standard. California's ozone standards are:

- 1-hour average standard at 0.09 ppm, not to be exceeded
- 8-hour average standard at 0.070 ppm, not to be exceeded

California's new 8-hour ozone standard is more stringent than the federal 8-hour ozone standard of 0.08 ppm. The U.S. EPA recently eliminated the national 1-hour ozone standard of 0.12 ppm and replaced it with their 8-hour ozone standard. As specified in the CCAA, the ARB has designated areas of California to be in "attainment" or "nonattainment" for the State ozone standards. The districts that are nonattainment for the State ozone standards are required by the CCAA to prepare plans, which must be designed to achieve and maintain the standards by the earliest practicable date. Each nonattainment district is also required to update their plans every three years to include the latest technical information, and any changes in demographics or other relevant information. In developing their plans, each district determines which measures are necessary to include, as well as the specific details of each included measure. In many of the nonattainment districts, substantial additional emission reductions will be necessary in order to achieve and maintain the State ozone standards. By revising their existing rules to be consistent with the SCM, the districts can achieve greater emission reductions to help them attain the ozone standards.

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